

CLAIMS

1. Insulating element in the form of a plate or roll felt for shipbuilding, from mineral fibers, bound in a physiological agent, especially insulating element, utilized as fire and/or thermal-and/or sound protection, **characterized in that** the composition of the mineral fibers of the insulating element amounts to an alkali/alkaline-earth mass ratio of < 1 and the fiber structure of the insulating element is determined exempt of beads as well as by an average geometrical fiber diameter of $\leq 4 \mu\text{m}$, a surface weight of 0,8 through 4,3 kg/m^2 and a portion of bonding agent, which referred to the fiber mass of the insulating elements is in the range above 0,5 through 4 weight %.

2. Insulating element according to claim 1, **characterized in that** the bonding agent is an organic bonding agent.

3. Insulating element according to claim 1 or 2, **characterized in that** the portion of the bonding agent, related to the fiber mass of the insulating element, lies within the range of 0,5 to 3 weight %, in particular 0.5 to 2 weight %.

4. Insulating element according to claim 1, particularly for the insulation of the ship deck, **characterized in that** the surface weight with a Fire Resistance Category A15 or similar amounts to 0,8 to 1.4 kg/m^2 , preferably 1.2 kg/m^2 , with a Fire Resistance Category A30 or similar, from 1,2 to 1.8 kg/m^2 , preferably 1.6 kg/m^2 , and with a Fire Resistance Category A60 or similar, 2,0 to 2.5 kg/m^2 , preferably 2.3 kg/m^2 .

5. Insulating element according to claim 1, particularly for the insulation ship bulk-head, **characterized in that** the weight per unit area with a Fire Resistance Category A15 or similar amounts from 0,8 to 1.4 kg/m^2 , preferably 1.2 kg/m^2 , with a Fire Resistance Category A30 or similar, from 2,3 to 3.0 kg/m^2 , preferably 2.7 kg/m^2 , and with a Fire Resistance Category A60 or similar, from 3,2 to 4.3 kg/m^2 , preferably 4.0 kg/m^2 .

6. Insulating element according to one of the preceding claims, by the fact **characterized in that** it features an λ -arithmetic procedure of $\leq 35 \text{ mW/mK}$.

7. Insulating element according to one of the preceding claims, by the fact **characterized in that** the bead portion in the fiber structure is $< 1 \%$.

5 8. Insulating element according to one of the preceding claims, thereby **characterized in that** the insulating elements are compressible, at least for the purpose of their packing, in the minimum ratio of 1:2, in case of an upper gross density to 50 kg/m^3 and in particular in the ratio of 1:3 in case of an upper gross density till 30 kg/m^3 .

10 9. Insulating element in the form of roll felt in accordance with preamble of claim 1, **characterized in that** the composition of the mineral fiber of the insulating element amounts to an alkali/alkaline-earth mass ratio of < 1 and the fiber structure of the insulating element is determined by an average geometrical fiber diameter of $\leq 4 \mu\text{m}$ and the roll felt features the form of a stepped wire mat, whose utilization temperature is $> 500^\circ\text{C}$ with
15 gross densities between 45 and 75 kg/m^3 , especially between 55 and 65 kg/m^3 , and a bonding agent content < 2 weight %, especially between $0,5$ and $1,5$ weight %.

10. Insulating element according to one of the preceding claims, **characterized in that** the mineral fibers of the insulating element are manufactured by an internal centrifugation in the centrifuge basket procedure, with a temperature at the centrifugation basket of at
20 least $1,100^\circ\text{C}$.

11. Insulating element according to one of the preceding claims, **characterized in that** it is designed for surpassing insulation of vessel's frames.

25 12. Molded section according to claim 11, **characterized in that** the molded section features a lamination, like an aluminum foil or a glass cloth fleece, being applied in such a manner around the frames that it encloses these units in one processing step exempt of a thermal bridge.

30 13. Insulating element and/or molded element according to one of the preceding claims, **characterized in that** the mineral fibers of the insulating element and/or molded

element, correspond, regarding their solubility in a physiological environment, to the requirements of the European guideline 97/69/EG and/or the requirements of the German dangerous material regulation exp. IV NR. 22.

- 5 14. Insulating element and/or molded element according to claim 13, **characterized by the** following ranges of the chemical composition of the mineral fibers:

SiO ₂	39 – 55 %	preferably	39 – 52 %
Al ₂ O ₃	16 – 27 %	preferably	16 - 26 %
CaO	6 – 20 %	preferably	8 - 18 %
MgO	1 - 5 %	preferably	1 – 4,9 %
Na ₂ O	0 - 15 %	preferably	2 - 12 %
K ₂ O	0 - 15 %	preferably	2 - 12 %
R ₂ O (Na ₂ O + K ₂ O)	10 – 14,7 %	preferably	10 – 13,5 %
P ₂ O ₅	0 - 3 %	especially	0 - 2 %
Fe ₂ O ₃ (iron total)	1,5 - 15 %	especially	3,2 - 8 %
B ₂ O ₃	0 - 2 %	preferably	0 - 1 %
TiO ₂	0 - 2 %	preferably	0,4 - 1 %
Other	0 – 2,0 %		